WHAT IS CLAIMED IS:

1. An apparatus for separating zones of a density gradient, comprising:

a float having a concave upper surface, said float being adapted for insertion into a vessel with a density gradient therein, said concave upper surface forming a well for capturing a zone of the density gradient.

2. An apparatus as set forth in claim 1 further comprising a positioning means for positioning the float within the density gradient for the removal of at least one zone of the gradient.

3. An apparatus as set forth in claim 1 wherein said float is formed with a convex lower surface.

4. An apparatus as set forth in claim 3, wherein said convex lower surface has a conical shape.

5. An apparatus as set forth in claim 3, wherein said convex lower surface has a spherical shape.

6. An apparatus as set forth in claim 1, wherein said concave upper surface has a conical shape.

7. An apparatus as set forth in claim 6, wherein a central portion of said concave upper surface has a spherical shape.

8. An apparatus as set forth in claim 1, wherein in response to downward movement of said float into the density gradient, at least one zone is capturable within said concave upper surface.

9. An apparatus as set forth in claim 1, wherein said float is made of a material having a density lower that the density than any of the zones of the density gradient such that said float is buoyant on an upper surface of the density gradient.

10. An apparatus as set forth in claim 9, wherein said float is made of a plastic material.

11. An apparatus as set forth in claim 2, wherein said positioning means includes a pipette contactable with a central portion of said concave upper surface.

12. An apparatus as set forth in claim 11, wherein movement of said pipette is controlled by a manually controlled mechanical positioning device.

13. An apparatus as set forth in claim 11 wherein movement of said pipette is controlled by a computer.

14. An apparatus as set forth in claim 11, wherein said pipette is connected to a means for selectively applying suction for removal of a captured zone of the density gradient.

15. An apparatus as set forth in claim 14, wherein said means for selectively applying suction is manually controlled by a microprocessor.

16. An apparatus as set forth in claim 1, wherein said concave upper surface is further formed with an annular groove for receiving a gripper.

17. A method for removing zones from a density gradient having a plurality of zones therein, the method comprising the steps of:

forming a density gradient in a vessel;

applying sample particles to the gradient;

centrifuging to separate the particles into one or more zones in the gradient;

inserting a float into the vessel, the float having a concave upper surface, the concave upper surface defining a well for capturing a zone of the density gradient;

pushing the float downward into the vessel such that at least a portion of one zone of the density gradient spills over an upper circumferential edge of the float into the well; and

removing the captured zone from the well.

18. A method as set forth in claim 17, wherein:

said pushing step includes using a pipette to contact and push the float downward; and

said removing step includes applying suction to the pipette to remove the captured zone from the well.

19. A method as set forth in claim 17, further comprising the steps of:

pushing the float downward into the vessel such that at least a portion of a second zone of the density gradient spills over an upper circumferential edge of the float into the well; and

removing the captured second zone from the well.

20. A method as set forth in claim 19, wherein:

said pushing step in claim 19 includes using a pipette to contact and push the float downward; and

said removing step in claim 19 includes applying suction to the pipette to remove the second captured zone from the well.

21. An apparatus for automatically separating and removing zones of a density gradient, comprising:

an X-Y manipulator device having a gripper;

a computer connected to said X-Y manipulator device for controlling position of said gripper;

a pipette positionable on said gripper;

a float having a concave upper surface, said float being adapted for insertion into a vessel with a density gradient therein, said concave upper surface forming a well for capturing a zone of the density gradient.

22. An apparatus as set forth in claim 21 wherein said computer controls movement of said X-Y manipulator device and said gripper for positioning said float within the density gradient for the removal of at least one zone of the gradient.

23. An apparatus as set forth in claim 21 wherein said float is formed with a convex lower surface.

24. An apparatus as set forth in claim 23, wherein said convex lower surface has a conical shape.

25. An apparatus as set forth in claim 23, wherein said convex lower surface has a spherical shape.

26. An apparatus as set forth in claim 21, wherein said concave upper surface has a conical shape.

27. An apparatus as set forth in claim 26, wherein a central portion of said concave upper surface has a spherical shape.

28. An apparatus as set forth in claim 21, wherein in response to downward movement of said float into the density gradient, at least one zone is capturable within said concave upper surface.

29. An apparatus as set forth in claim 21, wherein said float is made of a material having a density lower that the density than any of the zones of the density gradient such that said float is buoyant on an upper surface of the density gradient.

30. An apparatus as set forth in claim 29, wherein said float is made of a plastic material.

31. An apparatus as set forth in claim 22, wherein said pipette is contactable with a central portion of said concave upper surface.

32. An apparatus as set forth in claim 31, wherein said pipette includes a means for selectively applying suction for removal of a captured zone of the density

gradient.

33. An apparatus as set forth in claim 32, wherein said means for selectively applying suction is controlled by said computer.

34. An apparatus for automatically separating and removing zones of a density gradient, comprising:

a stationary pipetter;

a support table, said table being selectively moveable in vertical directions;

a vessel supported on said table;

a float having a concave upper surface, said float being inserted into said vessel with a density gradient therein, said concave upper surface forming a well for capturing a zone of the density gradient; and

at least one separate vessel for receiving removed portions of the density gradient.

35. An apparatus as set forth in claim 34 wherein said float is formed with a convex lower surface.

36. An apparatus as set forth in claim 35, wherein said convex lower surface has a conical shape.

37. An apparatus as set forth in claim 35, wherein said convex lower surface has a spherical shape.

38. An apparatus as set forth in claim 34, wherein said concave upper surface has a conical shape.

39. An apparatus as set forth in claim 34, wherein in response to upward movement of said table, said float is partially submerged such that at least one zone is capturable within said concave upper surface.

40. An apparatus as set forth in claim 34, wherein said float is made of a

material having a density lower that the density than any of the zones of the density gradient such that said float is buoyant on an upper surface of the density gradient.

41. An apparatus as set forth in claim 34, wherein said float is made of a plastic material.

42. An apparatus as set forth in claim 34, wherein a tip portion of said pipette is contactable with a central portion of said concave upper surface.

43. An apparatus as set forth in claim 34, further comprising:

a concentric tube surrounding a portion of said pipette;

a pressure supplying means connected to said concentric tube;

a cap having an aperture for receiving said concentric tube and said pipette, said cap being fitted on an upper portion of said vessel thereby sealing said vessel with said pipette and said concentric tube extending into said vessel; and

wherein said pressure supplying means selectively supplies air pressure to said concentric tube thereby increasing air pressure within said vessel forcing any liquid in said concave upper surface of said float into said pipette for delivery to said separate vessel.

44. An apparatus as set forth in claim 43, further comprising:

a table supporting said separate vessel and a plurality of other separate vessels, said table being moveable to position one of said separate vessels under an outlet connected to said pipette for receiving liquid from said pipette.

45. An apparatus as set forth in claim 43, further comprising an o-ring in said cap providing a seal between said concentric tube and said cap.

46. An apparatus as set forth in claim 43, further comprising an o-ring on said cap providing a seal between said vessel and said cap.

47. An apparatus as set forth in claim 43, further comprising a clamp for

fixing said cap to said vessel.

48. An apparatus as set forth in claim 43, wherein movement of said table is controlled by a computer.

49. An apparatus for manipulating floats, comprising:

a pair of gripper jaws configured for insertion into a depression in a float, said pair of jaws being extendable way from one another for contact with inner surfaces of the float.

50. An apparatus for manipulating floats, as set forth in claim 49, wherein said gripper jaws are spring biased away from one another.

51. An apparatus for manipulating floats, as set forth in claim 50, wherein said gripper jaws are urged toward each other by a pair of rollers that contact outer surfaces of a portion of said gripper jaws.

52. An apparatus for manipulating floats, as set forth in claim 51, wherein said pair of rollers are moved up and down along said portion of said gripper jaws by a positioning mechanism.

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